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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/541,296
Filing Date: July 06, 2005
Appellant(s): HAN ET AL.

William L. Androlia
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed January 8, 2010 appealing from the Office action mailed April 13, 2009.

(1) Real Party in Interest

The examiner has no comment on the statement, or lack of statement, identifying by name the real party in interest in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The following is a list of claims that are rejected and pending in the application: 1-13 and 15-18.

(4) Status of Amendments After Final

The examiner has no comment on the appellant's statement of the status of amendments after final rejection contained in the brief.

(5) Summary of Claimed Subject Matter

The examiner has no comment on the summary of claimed subject matter contained in the brief.

(6) Grounds of Rejection to be Reviewed on Appeal

The examiner has no comment on the appellant's statement of the grounds of rejection to be reviewed on appeal. Every ground of rejection set forth in the Office action from which the appeal is taken (as modified by any advisory actions) is being maintained by the examiner except for the grounds of rejection (if any) listed under the

subheading "WITHDRAWN REJECTIONS." New grounds of rejection (if any) are provided under the subheading "NEW GROUNDS OF REJECTION."

(7) Claims Appendix

The examiner has no comment on the copy of the appealed claims contained in the Appendix to the appellant's brief.

(8) Evidence Relied Upon

5,873,977	Desu et al.	2-1999
4,966,885	Hebard	10-1990
6,809,066	Reade et al.	10-2004
4,536,414	Kroger et al.	8-1985
6,316,391	Doi et al.	11-2001
6,251,835	Chu et al.	6-2001
5,738,731	Shindo et al.	4-1998

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102/103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application

> by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, 5, 9, 10-13, 17 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Hebard (U.S. 4966885).

Hebard teaches a process wherein a superconducting material YBCO is treated at the claimed energy and incidence angle wherein the ions are chosen from the claimed elements (col. 2).

As the process of irradiating the superconductor at the claimed process conditions, it appears that the modification would be bulk, external, or internal; the surface of the material is monocrystalline, amorphous, or polycrystalline; the surface is polished or unpolished.

These claimed properties appear to be inherently taught by the prior art as the prior art process is substantially similar to the claimed process.

Regarding the limitation of the particle beam is generated by a plasma sputtering device, it appears that the ion beam generated by the prior art (ion beam) is substantially similar to that of the claimed invention (plasma sputtering). It appears that the instantly claimed product by process is the same as that which is claimed (particle beam). When the examiner has found a substantially similar product as in the applied prior art, the burden of proof is shifted to the applicant to establish that their product is patentably distinct and not the examiner to show the same process as making. *In re Brown*. 173 USPQ 685 and *In re Fessman*, 180 USPQ 324.

Claims 1-4, 6, 8, 10-13, and 16 are rejected under 35 U.S.C. 102(b, e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Reade et al. (U.S. 6809066).

Reade et al. teach a method for ion texturing superconducting devices (col. 1) wherein materials to be textured include MgO, YSZ, ceria, nickel alloys, etc. (col. 3) wherein the claimed elements are used in the ion beam, claimed energies (col. 13) and the claimed angles (col. 11) are disclosed.

As the process of irradiating the superconductor at the claimed process conditions, it appears that the modification would be bulk, external, or internal; the surface of the material is monocrystalline, amorphous, or polycrystalline; the surface is polished or unpolished.

These claimed properties appear to be inherently taught by the prior art as the prior art process is substantially similar to the claimed process.

As to the limitation of wherein alloying constituents of the metal alloys are at least 0.1 wt%, one of ordinary skill in the art at the time applicant's invention was made would recognize that this limitation would be met by a multitude of metal alloys that would be used in accordance with the invention.

Regarding the limitation of the particle beam is generated by a plasma sputtering device, it appears that the ion beam generated by the prior art (ion beam) is substantially similar to that of the claimed invention (plasma sputtering). It appears that the instantly claimed product by process is the same as that which is claimed (particle beam). When the examiner has found a substantially similar product as in the applied prior art, the burden of proof is shifted to the applicant to establish that their product is patentably distinct and not the examiner to show the same process as making. *In re Brown*. 173 USPQ 685 and *In re Fessman*, 180 USPQ 324.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, 5, 9, 10-13, 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hebard (U.S. 4966885) in view of Desu et al. (US 5873977) or Kroger (US 4536414).

Hebard teaches a process wherein a superconducting material YBCO is treated at the claimed energy and incidence angle wherein the ions are chosen from the claimed elements (col. 2).

As the process of irradiating the superconductor at the claimed process conditions, it appears that the modification would be bulk, external, or internal; the

surface of the material is monocrystalline, amorphous, or polycrystalline; the surface is polished or unpolished.

These claimed properties appear to be inherently taught by the prior art as the prior art process is substantially similar to the claimed process.

If the claim requires that the ion beam is generated by a plasma sputtering device, Desu teaches a method of etching a thin film ferroelectric layers and superconductors (col. 1, 5) wherein dry etching techniques such as ion beam etching, plasma etching, and sputtering etching (sputtering etching appears to be equivalent plasma sputtering, col. 3) are well known dry etching techniques.

Kroger teaches a method of making a superconductor (col. 1) wherein it is known to treat substrates with sputter etching in an argon plasma (col. 2-3)

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide sputtering etching in Hebard because sputtering etching (Desu, sputtering etching appears to be equivalent plasma sputtering, col. 3; Kroger, col. 2, 3) is a well known dry etching technique as taught by Desu and Kroger and because one of ordinary can select from the known dry etching techniques based upon routine experimentation and considerations such as cost and design.

Claims 1-4, 6, 8,10-13, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reade et al. (U.S. 6809066) in view of Desu et al. (US 5873977) or Kroger (US 4536414).

Reade et al. teach a method for ion texturing superconducting devices (col. 1) wherein materials to be textured include MgO, YSZ, ceria, nickel alloys, etc. (col. 3) wherein the claimed elements are used in the ion beam, claimed energies (col. 13) and the claimed angles (col. 11) are disclosed.

As the process of irradiating the superconductor at the claimed process conditions, it appears that the modification would be bulk, external, or internal; the surface of the material is monocrystalline, amorphous, or polycrystalline; the surface is polished or unpolished.

These claimed properties appear to be inherently taught by the prior art as the prior art process is substantially similar to the claimed process.

As to the limitation of wherein alloying constituents of the metal alloys are at least 0.1 wt%, one of ordinary skill in the art at the time applicant's invention was made would recognize that this limitation would be met by a multitude of metal alloys that would be used in accordance with the invention.

If the claim requires that the ion beam is generated by a plasma sputtering device, Desu teaches a method of etching a thin film ferroelectric layers and superconductors (col. 1, 5) wherein dry etching techniques such as ion beam etching, plasma etching, and sputtering etching (sputtering etching appears to be equivalent plasma sputtering, col. 3) are well known dry etching techniques.

Kroger teaches a method of making a superconductor (col. 1) wherein it is known to treat substrates with sputter etching in an argon plasma (col. 2-3)

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide sputtering etching in Reade because sputtering etching (Desu, sputtering etching appears to be equivalent plasma sputtering, col. 3; Kroger, col. 2, 3) is a well known dry etching technique as taught by Desu and Kroger and because one of ordinary can select from the known dry etching techniques based upon routine experimentation and considerations such as cost and design.

Claims 15 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hebard (U.S. 4966885) in view of Chu et al. (U.S. 6251835).

Hebard teach a method as described above.

Hebard fail to teach wherein the superconductor is annealed at the claimed temperature after texturing.

Chu et al. teach a method of making superconductors (col. 1) wherein the YBCO is annealed after ion texturing for the purpose of restore crystallinity (col. 8-9).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide the YBCO is annealed after ion texturing in Hebard in order to restore crystallinity (col. 8-9) as taught by Chu et al.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Reade et al. (U.S. 6809066) in view of Doi et al. (U.S. 6316391) and Shindo et al. (U.S. 5738731).

Reade et al. teach a method of texturing superconductors as described above.

Reade et al. fail to teach a method of texturing semiconductors.

Shindo et al., teach a method of making a solar cell (col. 1) wherein it is known to texture the claimed semiconductors (col. 181-182, Entire Document).

Doi et al. teach that it is known to use GaAs as a substrate for a superconductor (col. 7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide wherein it is known to texture the claimed semiconductors (col. 181-182, Entire Document) in Reade et al. in order to provide a textured substrate for a superconductor (col. 7) as taught by Shindo et al. and Doi et al., respectively.

Claims 15 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hebard (U.S. 4966885) in view of Chu et al. (U.S. 6251835) and Desu et al. (US 5873977) or Kroger (US 4536414).

Hebard teach a method as described above.

Hebard fail to teach wherein the superconductor is annealed at the claimed temperature after texturing.

Chu et al. teach a method of making superconductors (col. 1) wherein the YBCO is annealed after ion texturing for the purpose of restore crystallinity (col. 8-9).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide the YBCO is annealed after ion texturing in Hebard in order to restore crystallinity (col. 8-9) as taught by Chu et al.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Reade et al. (U.S. 6809066) in view of Doi et al. (U.S. 6316391) and Shindo et al. (U.S. 5738731) and Desu et al. (US 5873977) or Kroger (US 4536414).

Reade et al. teach a method of texturing superconductors as described above.

Reade et al. fail to teach a method of texturing semiconductors.

Shindo et al., teach a method of making a solar cell (col. 1) wherein it is known to texture the claimed semiconductors (col. 181-182, Entire Document).

Doi et al. teach that it is known to use GaAs as a substrate for a superconductor (col. 7).

Therefore, it would have been obvious to one of ordinary skill in the art at the time applicant's invention was made to provide wherein it is known to texture the claimed semiconductors (col. 181-182, Entire Document) in Reade et al. in order to provide a textured substrate for a superconductor (col. 7) as taught by Shindo et al. and Doi et al., respectively.

(10) Response to Argument

I. Claims 1, 5, 9, 10-13, and 17 are anticipated under 35 USC 102 or, in the alternative, obvious under 35 USC 103 over Hebard.

A. Applicant has not demonstrated that the particle beam produced by a plasma sputtering device is substantially different from the particle beam produced by the apparatus of Hebard.

Applicant argues that the energetic particles generated by the ion guns (Hebard) or plasma sputtering systems (present invention) can knock atoms out of the surface of the target but that either sputtering or sputtering deposition, ion beam and plasma sputtering techniques are always strictly distinguished. (Brief at 8, ¶ 4).

Claim 1 recites in pertinent part:

> "A method for surface modification…comprising the step of bombarding a surface of a performed material with a particle beam having energy to increase the smoothness of the material…wherein the particle beam **is generated by** a plasma sputtering device and the energy of the particle beam is in the range of 5-50000 ev." (emphasis added).

While the claim recites that the particle beam is generated by a plasma sputtering device, applicant has not demonstrated that the particle beam produced by a plasma sputtering device of the present invention is substantially different from the particle beam produced by the ion gun of Hebard. The courts have held that when the claims at issue are method claims, the difference in structure of the apparatus used to carry out the method cannot be considered as a patentable limitation in the process. *In*

re Sweeney, 159 F.2d 752, 755 (C.C.P.A. 1947). *See also Stalego v. Heymes*, 120 U.S.P.Q. 473, 477-78 (C.C.P.A. 1959).

Applicant has stated that "the energetic particles of both the prior art and the present invention are able to knock atoms out of the surface of the target." (Brief at 8, ¶ 5). This statement supports the Office's position that there is no substantial difference between the particle beam produced by the prior art device of an ion gun and the plasma sputtering device of the present invention.

Applicant argues that plasma sputtering is a different concept from that of an ion gun. (Brief at 8, ¶ 4). However, the rejection is based on the premise that the particle beam produced by the plasma sputtering device is substantially similar to that of the particle beam produced by the prior art device. The rejection is not premised on the two apparatuses being based on the same concept.

Claim 17 recites in pertinent part:

> "A high temperature superconducting device, comprising…a high temperature superconducting film…bombarded with a particle beam having energy, wherein the particle beam **is generated by** a plasma sputtering device, and the energy of the particle beam is in the range of 5-50000 ev." (emphasis added).

The courts have held that "[if] the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). MPEP 2113.

Applicant has not shown a structural difference between a surface modified with a particle beam of the ion gun of Hebard and a surface modified with a particle beam of

the plasma sputtering device of the current invention. Indeed, applicant's own specification treats particle beams produced by plasma and an ion beam as substantially equivalent for the purposes of the invention (See Applicant's specification at page 7, lines 24-29, Embodiments 1-4). Applicant's specification also recites that the method is "bombarding a surface…with a particle beam having energy to increase the smoothness of the material surface and change the microstructure or internal defect of the processed material." (Applicant's Specification at page 7, lines 1-5). There is no mention of the particle beam's origin having an affect on the ability to increase smoothness, change microstructure or internal defect of the processed material. Applicant credits these characteristics to the energy of the particle beam alone.

Therefore, the rejection over Hebard should be maintained because the process of Hebard and the instant invention are substantially similar.

Applicant argues that the plasma sputtering technique of the invention is usually carried out in a vacuum system and that a conventional plasma sputtering system, a DC voltage is utilized. (Brief at 9, ¶ 1). It is unclear how this analysis demonstrates a substantial difference between the particle beam produced by the prior art and the particle beam produced by a plasma sputtering device. It appears that applicant is explaining the procedure by which the particle beam of the plasma sputtering device is formed, not how the two particle beams are different.

Applicant argues that the particles generated from the discharge gas are accelerated towards the target to produce sputtering and that for some materials an AC

voltage is required. (Brief at 9, ¶ 1). This argument only explains how the particle beam is formed, and does not establish a structural difference between the particle beam of the plasma sputtering device and particle beam of the prior art.

Applicant argues that magnetic field effects are used quite a lot in sputtering systems, which provides advantages in sputtering rate, extendibility of operating range and so on and that different types of magnetically enhanced plasma sputtering systems are utilized. (Brief at 9, ¶ 1). However, the claims are not limited to a plasma sputtering device that is magnetically enhanced. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., magnetically enhanced sputtering system) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Furthermore, it is unclear how a magnetically enhanced sputtering system produces a substantially different particle beam than a particle beam produced by an ion gun. Applicant states that advantages would include sputtering rate, extendibility of operating range, etc. (Brief at 9, ¶ 1). However, none of these advantages appear to demonstrate a substantial structural difference between the particle beam produced by a sputtering plasma device of the present invention and the particle beam produced by an ion gun. It is reiterated that a magnetically enhanced sputtering system is a feature

not claimed. Therefore, none of the advantages of the magnetically enhanced sputtering system described by applicant are applicable to the plasma sputtering system claimed.

Applicant argues that ion beam systems are always separate from the plasma sputtering system since the energetic particles are generated by special equipment. (Brief at 9, ¶ 2).

However, the claim is not limited in this respect. It does not appear that an ion beam apparatus being kept separate from a plasma sputtering device is relevant to the instantly claimed invention. It is reiterated that the applicant's own specification treats particle beams produced by plasma and an ion beam as substantially equivalent for the purposes of the invention (See Applicant's specification at page 7, lines 24-29, Embodiments 1-4).

Applicant argues that an ion gun is a device in which gas ions are produced, emitted, accelerated and focused as a rather narrow beam, the focus system of the ion sources can adjust the divergence of the ion beam, and that it can be concluded therefore that there are quite significant differences in the generation of the energetic particles between ion beam systems and plasma sputtering systems. (Brief at 9, ¶ 2 quoting "Thin film Processes").

However, applicant has not demonstrated how the structure of the particle beam of the prior art is substantially different from the particle beam of the present invention.

The rejection is based on the premise that the particle beam produced by the plasma sputtering device is substantially similar to that of the particle beam produced by the prior art device. Applicant has not shown a structural difference between a surface modified with a particle beam of the ion gun of Hebard and a surface modified with a particle beam of the plasma sputtering device of the current invention. The rejection is not based on the two apparatuses being substantially similar or producing particle beams in a substantially similar way.

Applicant argues that ion guns are relatively expensive, require lower pressure in a vacuum facility and some gases should be avoided to protect the ion gun and further that the plasma sputtering device is simpler, can be installed more easily, is at much lower cost and is suitable for mass production. (Brief at 9, ¶ 2).

However, it appears that the claim is not limited in this respect. Cost considerations and simplicity of use of different apparatus are not relevant to the instantly claimed invention. Put another way, economic advantages do not demonstrate a structural difference between the particle beam of the prior art and the particle beam of the claimed invention. Differences in cost do not demonstrate a structural difference between the surface of the material bombarded by the particle beam of the claimed invention and the surface of the material bombarded by the particle beam of the prior art. It is reiterated that the applicant's own specification treats particle beams produced by plasma and an ion beam as substantially equivalent for the purposes of the invention (See Applicant's specification at page 7, lines 24-29, Embodiments 1-4).

B. Applicant has not proffered any evidence of a comparison between the particle beam of the prior art and a particle beam of the claimed invention to establish unexpected properties.

Additionally, applicant argues that plasma sputtering usually can affect a rather large area (Brief at 9, ¶ 1). However, applicant has not demonstrated how the structure of the particle beam of the prior art is substantially different from the particle beam of the present invention. No objective evidence has been put forth to demonstrate a difference in the particle beams, or the surface of the material bombarded by the respective particle beams. Ex parte Gray, 10 USPQ2d 1922 (Bd. Pat. App. & Inter. 1989) (stating that the applicant should have made some comparison between the two products to establish unexpected properties since the materials appeared to be identical or only slightly different.) MPEP 2113.

Applicant argues that ion beam sputtering usually treats smaller areas relative to plasma sputtering, depending on the diameter of the ion gun and that the particles of the ion beam are better parallel focused and non-energetic while requiring a more expensive apparatus. (Brief at 9, ¶ 2).

Applicant has stated that in ion beam generation the divergence of the ion beam can be adjusted. (Brief at 9, ¶ 2). This suggests that the concentration of the beam may be adjusted such that a particle beam produced by an ion gun can be substantially

similar to that of the plasma sputtering apparatus, including less parallel focused particles and being non-energetic. Regarding the allegation of the particle produced by the prior art being non-energetic, Hebard teaches that the particle beam has an energy in the range of 50-1000 eV (col. 2, lines 55-64). This range taught in Hebard is a narrower range encompassed by the range of particle beam energy of claims 1 and 17 (5-50,000 eV). Therefore, Hebard teaches a particle beam that has a range of energy anticipatory of the energy level of the particle beam claimed. Applicant's specification recites that the method is "bombarding a surface…with a particle beam having energy to increase the smoothness of the material surface and change the microstructure or internal defect of the processed material." (Applicant's Specification at page 7, lines 1-5). There is no mention of the particle beam's origin having an affect on the ability to increase smoothness, change microstructure or internal defect of the processed material. Applicant credits these characteristics to the energy of the particle beam alone.

There is no evidence that the particles are more focused in a particle beam produced by the prior art in a non-obvious way. Therefore, even if there is a slight difference between the two particle beams, *arguendo*, (regarding particles of the ion beam being better focused) applicant has not proffered any evidence to show that a difference between the particle beam of the prior art and the particle beam of the plasma sputtering device are non-obvious variants. *Ex parte Gray*, 10 USPQ2d 1922 (Bd. Pat. App. & Inter. 1989) (stating that the applicant should have made some comparison between the prior art product and the claimed product to establish

unexpected properties since the materials appeared to be identical or only slightly different.) MPEP 2113.

In the instant case, there is no evidence of unexpected properties of the particle beam produced by the plasma sputtering device. Harper recites the factors in determining the ratio of ejected target atoms to incoming ion beams. (Harper, "Thin Film Processes", pg 191). These factors appear to include: mass of ions, angle of ion incidence, energy of the ion beam, and target material (Harper, "Thin Film Processes", pg 191). It appears that mass of ions depends on the gas used for the particle beam (not claimed), angle of ion incidence (not claimed), energy of the ion beam (claimed and taught by Hebard), and the target material (claimed in dependent claims and taught by Hebard). Therefore, it appears that the amount of target (surface being bombarded) depends at least in part on the energy of the ion beam. This limitation is claimed and taught by Hebard as discussed, *supra*. None of these factors appear to be dependent upon the apparatus producing the beam. Additionally, applicant has not shown how the surface of the material being bombarded by a particle beam of the plasma sputtering device is substantially different than the surface of the material being bombarded by a particle beam of the prior art. Indeed, Hebard teaches that the particle beam is used to reduce the roughness of a film surface (col. 4, lines 54-58). This is the same purpose of the particle beam of the instant invention (see claim 1). Additionally, applicant's own specification does not distinguish between the particle beam formed by plasma or an ion beam as discussed, *supra*.

Applicant argues that an ion beam system is not the same or a substitute for plasma sputtering systems (Brief at 10, ¶ 1). It is clear that ion beam systems are not the same as plasma sputtering systems. The rejection is based on the premise that the particle beam produced by the plasma sputtering device is substantially similar to that of the particle beam produced by the prior art device. Applicant has not shown a structural difference between a surface modified with a particle beam of the ion gun of Hebard and a surface modified with a particle beam of the plasma sputtering device of the current invention. The rejection is not based on the two apparatuses being substantially similar or producing particle beams in a substantially similar way.

For the foregoing reasons, the rejection over Hebard should be sustained.

II. Claims 1-4, 6, 8, 10-13, and 16 are anticipated under 35 USC 102 or, in the alternative, obvious under 35 USC 103 over Reade.

Applicant does not distinguish the argument between the rejection over Hebard and the rejection over Reade. Therefore, for the foregoing reasons recited in the arguments section referring to the rejection over Hebard, the rejection over Reade should be sustained.

III. Claims 1, 5, 9, 10-13, and 17 are obvious under 35 USC 103 over Hebard in view of either Desu or Kroger.

Applicant argues that plasma etching is a special conception of a process to take away a layer of a multi-layer structure to make a layer thinner and although plasma sputtering may result in some small amount of material being removed from the surface, this is not the main purpose. (Brief at 10, ¶ 6). Both plasma etching and plasma sputtering remove material from the surface. It appears that applicant is attempting to discern a difference between a purpose to make a layer thinner (plasma etching) and actually making a layer thinner (both plasma etching and plasma sputtering). It is unclear how this distinction results in the claim not being met by the combination of Hebard in view of either Desu or Kroger. It is maintained that the particle beam produced by a plasma etching device is equivalent to the particle beam produced by a plasma sputtering device. Applicant has not shown that the particle beam of the plasma etching device is indistinguishable from (or obvious over) the particle beam of the plasma sputtering device by proffered objective evidence. A structural difference between a surface modified with a particle beam of the ion gun of Hebard and a surface modified with a particle beam of the plasma sputtering device of the current invention also has not been demonstrated. MPEP 2113.

Applicant argues that a plasma or sputtering etching process can be used to achieve the goals of a plasma sputtering process such as : making the surface

smoother, or to change the material surface, or to reduce the defects in the material. (Brief at 10, ¶ 6).

This argument is not persuasive for at least two reasons.

First, it appears that producing smoothness is achieved by the energy of a particle beam. See discussion of Harper at pg 191, as discussed *supra*. This point is buttressed by recitation the in applicant's specification that particle beams produced by plasma and an ion beam as substantially equivalent for the purposes of the invention (See Applicant's specification at page 7, lines 24-29, Embodiments 1-4). Applicant's specification also recites that the method is "bombarding a surface…with a particle beam having energy to increase the smoothness of the material surface and change the microstructure or internal defect of the processed material." (Applicant's Specification at page 7, lines 1-5). There is no mention of the particle beam's origin having an affect on the ability to increase smoothness, change microstructure or internal defect of the processed material. Applicant credits these characteristics to the energy of the particle beam alone.

Second, Desu teaches that sputter etching can be used to smooth a surface of a material under known conditions (col. 7, lines 40-51). Therefore, it appears that Desu teaches that a smooth surface can be achieved by sputter etching under certain conditions.

Applicant argues Desu uses plasma etching to cause etching of the thin film of ferroelectric material. (Brief at 10, ¶ 6). It appears that applicant is arguing that Desu

does not teach etching of a superconductor material. However, Desu is relied upon for teaching a method of etching a thin film as recited in the rejection, *supra*. Desu is not relied upon to teach etching a superconductor material. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Additionally, applicant has not argued that there is no motivation for combining Desu with Hebard. Therefore, this rejection should be maintained.

Applicant argues that Kroger teaches that sputtering etching results in substantial improvement of the sub-gap current-voltage characteristic of a superconductive tunnel junction device. (Brief at 10, ¶ 6). The claim is not limited in this respect. It does not appear that sputtering etching results in a substantial improvement of the sub-gap current-voltage characteristic of the superconductive tunnel junction device is relevant to the instantly claimed invention. It is reiterated that the applicant's own specification treats particle beams produced by plasma and an ion beam as substantially equivalent for the purposes of the invention (See Applicant's specification at page 7, lines 24-29, Embodiments 1-4).

For the foregoing reasons, the rejection over Hebard in view of either Desu or Kroger should be sustained.

IV. Claims 1-4, 6, 8, 10-13 and 16 are obvious under 35 USC 103 over Reade in view of either Desu or Kroger.

Applicant does not distinguish the argument between the rejection over Hebard in view of either Desu or Kroger and the rejection over Reade in view of either Desu or Kroger. Therefore, for the foregoing reasons recited in the arguments section referring to the rejection over Hebard in view of either Desu or Kroger, the rejection over Reade in view of either Desu or Kroger should be sustained.

V. Claim 7 is obvious under 35 USC 103 over Reade in view of Doi and Shindo.

Applicant argues that Shindo is related to the production of solar cells and has nothing to do with superconductors. (Brief at 12, ¶ 1). Shindo is specifically relied upon to teach the irradiation of semiconductor materials such as GaAs, *inter alia*, (col. 175, lines 15-32). Shindo is not relied upon to teach bombarding a superconductor material. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Additionally, it appears that Doi supplies the motivation to combine Shindo with Reade. Specifically, Doi is relied upon to teach that semiconductor materials, such as GaAs, are well known substrates for superconductor layers (col. 7, lines 49-60).

Applicant argues that neither Shindo nor Doi teach the use of a particle beam generated by a plasma sputtering device for surface modification in manufacturing high temperature superconducting devices. (Brief at 12, ¶ 1). Shindo and Doi are relied upon to teach texturing semiconductors as discussed in the rejection, *supra*. Shindo and Doi are not relied upon to teach the use of a particle beam generated by a plasma sputtering device for surface modification in manufacturing high temperature superconducting devices. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

VI. Claims 15 and 18 are obvious under 35 USC 103 over Hebard in view of Chu.

Applicant argues that Chu teaches an ion beam technique utilized to generate the GCID which is different from the plasma sputtering of Appellant's invention. (Brief at 12, ¶ 3). Applicant has not shown how the GCIB (col. 2, lines 1-6) is substantially different from Hebard individually or Hebard in view of either Desu or Kroger. Additionally, Chu is not relied upon to teach the use of a plasma beam generated by a plasma sputtering device for surface modification in manufacturing high temperature superconducting devices. Chu is only relied upon to teach annealing a superconductor

after the surface of said superconductor has been textured in order to restore crystallinity. (See claims 42 and 43). In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

VII. Claims 15 and 18 are obvious under 35 USC 103 over Hebard in view of Chu and either Desu or Kroger.

Applicant argues that the prior art cited by the Office does not describe the use of a particle beam generated by a plasma sputtering device for surface modification in manufacturing high temperature superconducting devices. (Brief at 12, ¶ 5). This argument appears to target Hebard, Desu, and Kroger. However, the particle beam produced by apparatus of these references is substantially similar to the particle beam produced by the plasma sputtering device of the claimed invention as discussed above.

Applicant argues that the prior art cited by the Office is from a divergent art. (Brief at 12, ¶ 5). This argument appears to target Desu. Desu is relied upon to teach a method of etching a thin film as recited in the rejection, *supra*. Desu is not relied upon to teach etching a superconductor material. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references.

See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

In response to applicant's argument that Desu is nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, Desu is reasonably pertinent to the problem of texturing a thin film via a particle beam.

Applicant argues that the combination of prior art cited by the Office would not be suggested to one of ordinary skill. (Brief at 12, ¶ 5). However, applicant has not pointed out how the combination of Hebard, Chu, and Desu or Kroger would not have been suggested to one of skill in the art. In view of the rejection and the arguments above, the rejection should be sustained.

VII. Claim 7 is obvious under 35 USC 103 over Reade in view of Doi and Shindo and Desu or Kroger.

Applicant does not put forth additional arguments regarding Reade, Doi, Shindo, and Desu or Kroger. Therefore, for the foregoing reasons recited in the arguments section regarding the references Reade, Doi, Shindo, and Desu or Kroger, the rejection over Reade, Doi, Shindo, and Desu or Kroger should be sustained.

VII. CONCLUSION.

Applicant has not proffered any objective evidence of any kind to support the allegation that the particle beam produced by the prior art apparatus and the particle beam of the instantly claimed apparatus are substantially different or unobvious variants. Applicant's own specification points to a conclusion that the instantly claimed process can be carried out using a particle beam produced by the prior art device as the particle beam of the prior art has the requisite energy value. Similarly, the instantly claimed product can be produced by the process of bombarding a high temperature superconductor with a particle beam produced by the apparatus of the prior art.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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